

Singular scientists

Ioan James FRS

J R Soc Med 2003;96:36–39

Asperger people are quite common in the general population, but it is not fully appreciated how many well-known people in the arts and sciences had the Asperger syndrome. When I came across several possibilities—namely Isaac Newton, Henry Cavendish and Albert Einstein—in the course of writing¹ about the lives of famous physicists, I consulted Simon Baron-Cohen, the psychiatrist who heads the autism research centre at Cambridge. He agreed that Newton and Einstein seemed fairly certain, judging by accepted criteria; also Cavendish were it not for the lack of information about his childhood. In his recent autobiography *Uncle Tungsten*² Oliver Sacks digresses at one point to discuss the early *Life of Cavendish* by George Wilson, and concludes by saying: ‘Newton’s emotional singularities, his jealousy and his suspiciousness, his enmities and rivalries suggested a profound neurosis, but Cavendish’s remoteness and ingenuousness were much more suggestive of autism or Asperger’s syndrome. I now think Wilson’s biography may be the fullest account we are ever likely to have of the life and mind of a unique autistic genius’¹.

Hans Asperger was a Viennese paediatrician who described in his doctoral thesis of 1944³ (see Ref. 4 for a translation) how among the people he had examined there were a large number who he regarded as mildly autistic but who were otherwise remarkably able. He was struck by the fact that they usually had some mathematical ability and tended to be successful in scientific and other professions where this was relevant:

‘To our own amazement, we have seen that autistic individuals, as long as they are intellectually intact, can almost always achieve professional success, usually in highly specialized academic professions, often in very high positions, with a preference for abstract content. We found a large number of people whose mathematical ability determines their professions; mathematicians, technologists, industrial chemists and high-ranking civil servants.’

He went on to say:

‘A good professional attitude involves single-mindedness as well as a decision to give up a large number of other interests. Many people find this a very unpleasant decision. Quite a number of young people choose the wrong job because, being equally talented in different areas, they cannot muster the dedication to focus on a single career. With the autistic individual the matter is entirely different. With collected energy and obvious confidence and, yes, with a blinkered attitude towards life’s rich rewards, they go their own way, the way in which their talents have directed them since childhood.’

Later Asperger went so far as to write: ‘It seems that for success in science or art a dash of autism is essential. For success the necessary ingredients may be an ability to turn away from the everyday world, from the simple practical, an ability to rethink a subject with originality so as to create in new untrodden ways, with all abilities canalised into the one speciality’. When his investigations eventually came to wide attention the term Asperger syndrome was introduced to describe the kind of people he was referring to. Today the description is used for a high-functioning variant of autism with predominantly good language and intelligence and better social insight than other forms of autism. The syndrome is not uncommon: more than one person in a thousand may have it. Diagnosis demands a positive answer to a sufficient number of questions on a standard list. Various lists have been proposed, but they all include social impairment and an intense preoccupation with certain subjects. These and other characteristics are illustrated in what follows.

Isaac Newton and Albert Einstein need no introduction. Between them came Henry Cavendish, one of the great ‘natural philosophers’ of the later eighteenth century, a pioneer of electrical research and much else. As well as these three I believe there are other scientists who may have been Asperger people, including Marie Curie and her elder daughter the atomic physicist Irène Joliot-Curie, also the theoretical physicist Paul Dirac. I will describe some of the evidence for each of these six, but resist the temptation to go on to discuss people in other spheres, such as the painter

Mathematical Institute, 24–29 St Giles, Oxford OX1 3LB, UK

Correspondence to: Professor I M James

E-mail: imj@maths.ox.ac.uk

J M W Turner, the composer Béla Bartók and the philosopher Ludwig Wittgenstein, where there also seems to be a possible case.

Autistic people experience a profound feeling of being alone in the world—'unable to form a conception of others that attributes mental states to them'. For example, Isaac Newton's boyhood has been described as lonely and loveless. Henry Cavendish was said by a contemporary to 'consider himself as a solitary being in the world, and to feel himself unfit for society'. Of the many stories told about his idiosyncrasies, one concerns a distinguished foreign scientist who said he wished to meet 'one of the greatest intellectual ornaments of this country, and one of the most profound philosophers of all time'. Cavendish was so embarrassed that he was reduced to total silence and escaped in his carriage at the first opportunity. Einstein too was a loner: 'I'm not much with people', he declared. As a child he was shy, lonely and withdrawn from the world. One of his biographers remarked that he 'never really needed human contacts; he deliberately freed himself more and more from all emotional dependence in order to become entirely self-sufficient'.

A lack of interest in communication with others is another characteristic. It is said that Newton deliberately made the *Principia* abstruse, using mathematical arguments to put off the uninitiated. He did not find it easy to express fundamental convictions publicly, preferring to remain silent rather than expose himself to the risk of criticism. Henry, later Lord, Brougham said that Cavendish 'probably uttered fewer words in the course of his life than any man who lived to fourscore years, not at all excepting the monks of La Trappe'. Einstein explained, 'I do not socialize because social encounters would distract me from my work and I really only live for that, and it would shorten even further my very limited lifespan'.

As a child Newton was 'never known scarce to play with the boys abroad'. One of his biographers described him as 'singularly unable to form intimate friendships. Morbidly suspicious and secretive, he was subject to peevish outbreaks of ill-temper, even towards those who were his best friends. On such occasions he stooped to regrettable acts which involved him in a succession of painful controversies that plagued his life, robbed him of the just fruits of his work, and disheartened his sincere admirers...'. Newton 'had not within himself the resource from whence to inculcate high and true motives of action upon others,' said another, 'The fear of man was before his eyes. All his errors are to be traced to a disposition which seems to have been born with him.'

Einstein was described as 'lonely and dreamy' as a child, with a difficulty of making friends. Very early he decided to establish himself as an entirely separate entity, influenced as little as possible by other people. In his youth and later in

Berlin he had friends to whom he could talk and unburden himself, such as the atomic physicist Lise Meitner, but she commented on his elusive coldness towards colleagues, even those who knew him well. One of these colleagues concluded: 'Einstein was a naturally solitary person who didn't want his weaknesses to show and didn't want to be helped even when they did show'.

Some peculiarity of dress is also common in Asperger people, perhaps a reflection of the disregard for the feelings of others. Newton was said to be untidy and slovenly; when in Cambridge he very rarely went to dine in the college hall and then 'if he had not been minded, he would go very carelessly, the shoes down at heels, stockings untied, surplice on, and his head scarcely combed'. Cavendish retained the dress of his youth—faded violet suit with high collar, frilled shirt-wrists, and a knocker-tailed periwig. Each year on a fixed day his tailor provided him with a new suit which was a replica of the old one. Although Einstein kept a wardrobe of seven identical suits to wear on formal occasions, his ordinary dress was casual; he favoured sweatshirts, leather jackets and sandals.

A strong adherence to routine is another characteristic of Asperger people. Cavendish was very much a man of habit, invariably dining off leg of mutton, and taking exactly the same solitary walk every day, wearing an old-fashioned three-cornered hat. During his Berlin period, Einstein was in the habit of sailing a dinghy by himself on one of the numerous lakes formed by the river Havel. Perhaps it is unfair to class this as a strong adherence to routine, but later in his life, when he had moved to America, he said that really his only friend in Princeton was the neurotic mathematician Kurt Gödel, who used to call for him every morning at 11 o'clock so that, whatever the weather, they could walk together the mile to Fuld Hall.

Some degree of obsessive behaviour is also to be expected, but evidence for this is more difficult to produce. Of course it could be argued that, when the object of the obsession is an important scientific problem, it is partly this which enables Asperger people to make major discoveries. Newton's boyhood enthusiasm for constructing mechanical models developed into a passion for making scientific instruments, especially optical instruments, and he did so supremely well. However, Newton had other obsessions which were less commendable. Alchemy was one of these—an offshoot of his chemical experiments. Among his other peculiarities was a compulsion to make draft after draft of his papers—as many as eighteen, differing only slightly from each other, for the first chapter of his *Chronology*—and he even felt the need to copy routine documents relating to the business of the Royal Mint, where he held the position of Warden. *The Chronicles of the Ancient Kingdoms Amended and Observations on the Prophecies of Daniel and the Apocalypse of*

St John, books that appeared after his death, were the fruits of an obsessive interest in such matters during the latter part of his life.

Newton was described as a man of very few words: 'he would sometimes be silent and thoughtful for above a quarter of an hour together, and all the while almost as if he was saying his prayers; but [that] when he did speak, it was always very much to the purpose'. 'Newton would with great acuteness answer a question,' it was said, 'but would very seldom start one.' Einstein was a confusing lecturer, giving specific examples followed by seemingly unrelated general principles. Sometimes he would lose his train of thought while writing on the blackboard. A few minutes later he would emerge as if from a trance and go on to something different. Like many Asperger people⁵, Einstein had a predominantly visual style of thinking and learning. As he explained: 'thoughts do not come in any verbal formulation. I rarely think in words at all. A thought comes and I try to explain it in words afterwards'.

Some of the characteristics I have described can, of course, be found in some degree in normal people but others not. For example, unusual vocalizations and unusual gait can occur. Brougham recalled seeing Cavendish at a Royal Society conversation and hearing 'the shrill cry he uttered as he shuffled quickly from room to room, seeming to be annoyed if looked at, but sometimes approaching to hear what was passing among others'. He also remarked that Cavendish's walk was 'quick and uneasy'. As a child Einstein was echolalic, repeating to himself what he heard to make sure he heard it correctly, and continued to be so as an adult.

One of Newton's biographers described his complex personality in the following words:

'...some evil fate cursed him with a suspicious and jealous temperament which marred his life. This taint in his blood did not show itself in the form of ordinary vanity but in an inordinate sensitiveness to any personal criticism or to a reflection on his personal honour. In spite of his love of meditation and of peace free of all distractions it involved him in constant quarrels and altercations; and during a long and illustrious life it raised an impenetrable barrier between him and other men. To his friends he was never more than lukewarm and he kept them constantly uneasy lest they had offended him; to his rivals he was, at times, disingenuous, unjust and cruel.'

Cavendish, like Newton, was highly sensitive to criticism. As a result he published remarkably little—although when Clerk Maxwell was editing Cavendish's electrical researches for publication, after his death, he found twenty packages of manuscripts on the subject.

All biographers agree that Einstein had an extraordinary passion for music. He was an enthusiastic violinist; Bach, Mozart and Schubert were his favourite composers. When he was world-famous as a physicist he is reported to have said that music was as important to him as physics: 'it is a way for me to be independent of people'; on another occasion he described it as the most important thing in his life. Photographs of him playing the violin with scientists such as Max Born, Paul Ehrenfest, Jacques Hadamard, Adolph Hurwitz or Max Planck show a different Einstein from the more familiar images.

Einstein was a Nobel Laureate, and it is not difficult to find others who might well have been Asperger people. For example there is Paul Dirac, one of the architects of quantum mechanics, whose centenary has recently been celebrated. His schoolfellows remember him as silent and aloof. Dirac was remarkably taciturn; he explained that when young he learned that he should not start a sentence unless he knew how to finish it—not a recipe for spontaneous conversation. Like Einstein, he was echolalic. Dirac's wife Margit described him as 'too aloof' with their children, but the marriage seems to have worked. A colleague in Cambridge, who had known Dirac for years, said 'I still find it very difficult to talk with Dirac. If I need his advice I try to formulate my question as briefly as possible. The response would come as from the witness stand. He looks for five minutes at the ceiling, five minutes at the windows, and then says "yes" or "no". And he was always right. Dirac responded factually to direct questions, and the five-word answer might take five days to comprehend'. Many characteristics of Dirac remind us of Newton.

Another Nobel Laureate who might have had Asperger syndrome was Irène Joliot-Curie, elder daughter of Marie and Pierre Curie. She inherited the shyness of both her parents as well as their abilities, and had great difficulties in greeting and dealing with strangers. She was described as 'rather awkward in her movements', by nature very reserved; she had difficulty in making friends. She never acquired the art of casual conversation and grew up insensitive to the attitude of others. In argument she was incapable of the least deceit or artifice or of making the smallest concession. With an implacable obstinacy she would present her thesis, meeting her interlocutor head on, whoever he might be. Her imperturbable calm and her direct manner in replying to questions made her seem cold and somewhat haughty. She took little interest in her appearance and dress. Like her mother she always wore the simplest of garments, but in her case they were crude and inelegant.

Although the cause of the Asperger syndrome, and of autism generally, remains unknown, a genetic factor is certainly involved. The condition is not exactly hereditary but there is usually some trace of the syndrome elsewhere

in the family. There may be an example of this in the case of Joliot-Curie; both her parents were introverted but she seems to have taken more after her uncompromising mother. Marie Curie did not greatly care what impression she created. She was found difficult to engage in conversation, and to be liable to naively misinterpret what she believed to be other people's reactions to her. The famous determination to isolate radium had an obsessive quality; likewise her practice of keeping a detailed record of domestic expenditure. 'I feel everything very violently', she once said, 'with a physical violence.' We know that Einstein was violent as a child and, later, towards his first wife. He said that Irène, who became a close friend, 'got her way mainly by grumbling, like her mother'. Although it seems very possible that both mother and daughter had the syndrome, the evidence is stronger in the case of Irène. Since the syndrome occurs much more frequently in men than in women, perhaps in a proportion of five to one, these examples if confirmed would be particularly interesting.

According to the standard criteria there does not seem much doubt that Isaac Newton, Henry Cavendish and Albert Einstein were Asperger people; in fact Newton appears to be the earliest known example of a person with any form of autism. It may not be too late to obtain relevant information from people who knew Paul Dirac or Irène Joliot-Curie to supplement the clues which may be found in biographies. Since autism became generally recognized by psychiatrists only in the past sixty years, many cases must have gone undiagnosed. It is surprising that recent biographers should pass over this aspect of their subjects. Although it seems to be widely accepted that Einstein had the syndrome, none of the many detailed biographies mentions this.

Simon Baron-Cohen uses the suggestive term 'folk psychology' to describe the normal ability to read the facial expressions of other people and know intuitively what they mean, and the term 'folk physics' to describe the ability that certain professional people, such as architects, engineers and physicists, have of thinking and working—and not only

professionals but also many kinds of craftsmen. He has suggested that Asperger people have a deficit of folk psychology, which is compensated for by an unusual ability in folk physics. A recent survey⁶ of Cambridge undergraduates confirmed the belief that it is among the students of mathematics, physics, engineering and computer science that Asperger syndrome is most likely to be found.

Asperger people who write objectively and accurately about their condition, as several have done⁶, describe the great feeling of joy they experienced at discovering they are not unique in the world but that there are others just like themselves. There is no 'cure' for the Asperger syndrome, and those who have it say that on the whole they are glad of this. As thirteen-year-old Luke Jackson writes⁷, in his *Freaks, Geeks and Asperger Syndrome: a User Guide to Adolescence*, 'To cure someone of AS would be like taking away their personality, and some really cool abilities too'. What Asperger people would appreciate is a little more understanding from the rest of us, so that their lives are not made unnecessarily difficult. They tend to have a particularly bad time at school. The syndrome is not properly understood by otherwise well-informed people, who find it hard to realize what those who are 'handicapped' in this way may be capable of achieving.

REFERENCES

- 1 James I. *Remarkable Physicists*. Cambridge: Cambridge University Press, 2003
- 2 Sacks O. *Uncle Tungsten*. London: Picador Books, 2001
- 3 Asperger H. Die 'autischen Psychopathen' im Kindesalter. *Arch Psychiatrie Nervenkrankheiten* 1944;17:76–136
- 4 Frith U, ed. *Autism and Asperger Syndrome*. Cambridge: Cambridge University Press, 1991
- 5 Grandin T. *Thinking in Pictures*. New York: Vintage Books, 1996
- 6 Baron-Cohen S, Wheelwright S, Skinner R, Martin J, Clubley L. The autism-spectrum quotient (AQ): evidence for Asperger syndrome/high-functioning autism, males and females, scientists and mathematicians. *J Autism Devel Disord* 2001;31:5–17
- 7 Jackson L. *Freaks, Geeks and Asperger Syndrome: a User Guide to Adolescence*. London: Jessica Kingsley, 2002